CLAIMS

- A catalyst composition comprising: 1.
- 1) a gelling catalyst represented by the general formula:

in which:

A represents CH or N,

A represents CH or N, R^4 represents hydrogen or the group $A-(CR^2R^3)_{n}$,

10

15

5

n represents an integer between 1 and 3, inclusive,

R² and R³ each represent hydrogen or a C1-C6 alkyl group, and

R⁶ represents H or 3-aminopropyl, provided that:

when A is N, R⁴ and R⁵ each represents a C1-C6 alkyl group or together represent a C2-C5 alkylene group which is hydrogen, a C1-C4 alkyl group, or the group $\begin{pmatrix} \mathsf{R}^4 \\ \mathsf{A}\text{-}(\mathsf{CR}^2\mathsf{R}^3)_{\mathsf{n}}\text{-} \end{pmatrix}$ represent a C2-C5 alkylene group which may contain a ring amine moiety -NR-, where R

when A is CH, R⁴ and R⁵ together represent a C2-C5 alkylene group containing a ring amine moiety -NR-, where R is a C1-C4 alkyl group or the group

2) a blowing catalyst according to the general formula:

25

wherein:

R⁷, R⁸, and R⁹ each independently represents a C1-C4 alkyl group;

R¹⁰ represents H, a C1-C4 alkyl group, a C6-C20 aryl group, or a C6-C20 aralkyl group;

m, p, and q each independently represents an integer between 1 and 4, inclusive; and Z represents -OH, -NH₂, -NH-CO-NH₂, or

$$N-(CH_2)_m-O-(CH_2)_p-NR^9-(CHR^{10})_q-NH-CO-NH-R^8$$

5

- 2. The catalyst composition of claim 1, wherein R⁴ and R⁵ are each a methyl group, A is nitrogen, and R² and R³ are each hydrogen.
- 3. The catalyst composition of claim 1, wherein R⁷, R⁸, and R⁹ are each a methyl group, m and p are each equal to 2, and q is either 2 or 3.
 - 4. The catalyst composition of claim 1, wherein A is CH, n is an integer between 1 and 3, inclusive, and R⁴ and R⁵ together constitute -CH₂CH₂N(CH₃)CH₂-.
- 5. The catalyst composition of claim 1, wherein the gelling catalyst comprises N,N,N",N"-tetramethyldipropylenetriamine.
 - 6. The catalyst composition of claim 1, wherein the gelling catalyst comprises 3-dimethylaminopropylamine.

20

- 7. The catalyst composition of claim 1, wherein the gelling catalyst comprises N,N-bis(3-dimethylaminopropyl)-1,3-propanediamine.
- 8. The catalyst composition of claim 1, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-2-hydroxyethylbis(aminoethyl) ether.
 - 9. The catalyst composition of claim 8, wherein the gelling catalyst comprises N,N,N",N"-tetramethyldipropylenetriamine.

- The catalyst composition of claim 8, wherein the gelling catalyst 10. comprises 3-dimethylaminopropylamine.
- The catalyst composition of claim 8, wherein the gelling catalyst 11. comprises N,N-bis(3-dimethylaminopropyl)-1,3-propanediamine. 5
 - 12. The catalyst composition of claim 1, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-3-aminopropylbis(aminoethyl) ether.
- The catalyst composition of claim 1, wherein the blowing catalyst 10 13. comprises N,N,N'-trimethyl-N'-3-ureidopropylbis(aminoethyl) ether.
 - 14. The catalyst composition of claim 1, further comprising a carboxylic acid that forms a salt with one or both of the gelling catalyst and the blowing catalyst.
 - 15. A formulation for producing a polyurethane foam, the formulation comprising a polyol, a polyisocyanate, water, and a catalyst composition comprising:
 - 1) a gelling catalyst represented by the general formula:

20

15

in which:

A represents CH or N,

 R^1 represents hydrogen or the group $\left(\begin{array}{c} H^4 \\ A-(CR^2R^3)_{n^-} \end{array}\right)$

25 n represents an integer between 1 and 3, inclusive,

R² and R³ each represent hydrogen or a C1-C6 alkyl group, and

R⁶ represents H or 3-aminopropyl, provided that:

when A is N, R^4 and R^5 each represents a C1-C6 alkyl group or together represent a C2-C5 alkylene group which may contain a ring amine moiety -NR-, where R is hydrogen, a C1-C4 alkyl group, or the group R^4 , and R^5 and R^6 .

when A is CH, R⁴ and R⁵ together represent a C2-C5 alkylene group containing a ring amine moiety -NR-, where R is a C1-C4 alkyl group or the group

10 2) a blowing catalyst according to the general formula:

$$N-(CH_2)_m-O-(CH_2)_p-NR^9-(CHR^{10})_q-Z$$

wherein:

R⁷, R⁸, and R⁹ each independently represents a C1-C4 alkyl group;

15 R¹⁰ represents H, a C1-C4 alkyl group, a C6-C20 aryl group, or a C6-C20 aralkyl group; m, p, and q each independently represents an integer between 1 and 4, inclusive; and Z represents -OH, -NH₂, -NH-CO-NH₂, or

$$N-(CH_2)_m-O-(CH_2)_p-NR^9-(CHR^{10})_q-NH-CO-NH-R^8$$

20

- 16. The formulation of claim 15, wherein R⁴ and R⁵ are each a methyl group, A is nitrogen, and R² and R³ are each hydrogen.
- 17. The formulation of claim 15, wherein R⁷, R⁸, and R⁹ are each a methyl group, m and p are each equal to 2, and q is either 2 or 3.
 - 18. The formulation of claim 15, wherein A is CH, n is an integer between 1 and 3, inclusive, and R⁴ and R⁵ together constitute -CH₂CH₂N(CH₃)CH₂-.

10

25

- 19. The formulation of claim 15, wherein the gelling catalyst comprises N,N,N",N"-tetramethyldipropylenetriamine.
- 5 20. The formulation of claim 15, wherein the gelling catalyst comprises 3-dimethylaminopropylamine.
 - 21. The formulation of claim 15, wherein the gelling catalyst comprises N,N-bis(3-dimethylaminopropyl)-1,3-propanediamine.

22. The formulation of claim 15, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-2-hydroxyethylbis(aminoethyl) ether.

- 23. The formulation of claim 22, wherein the gelling catalyst comprises N,N,N",N"-tetramethyldipropylenetriamine.
 - 24. The formulation of claim 22, wherein the gelling catalyst comprises 3-dimethylaminopropylamine.
- 25. The formulation of claim 22, wherein the gelling catalyst comprises N,N-bis(3-dimethylaminopropyl)-1,3-propanediamine.
 - 26. The formulation of claim 15, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-3-aminopropylbis(aminoethyl) ether.
 - 27. The formulation of claim 15, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-3-ureidopropylbis(aminoethyl) ether.

- 28. The formulation of claim 15, further comprising a carboxylic acid that forms a salt with one or both of the gelling catalyst and the blowing catalyst.
- 29. A polyurethane foam comprising a product of a reaction between a polyol
 and a polyisocyanate, the reaction taking place in the presence of water and a catalyst composition comprising:
 - 1) a gelling catalyst represented by the general formula:

10

20

in which:

A represents CH or N,

 R^1 represents hydrogen or the group $\left(\begin{array}{c} A-(CR^2R^3)_{n^-} \end{array} \right)$

n represents an integer between 1 and 3, inclusive,

15 R² and R³ each represent hydrogen or a C1-C6 alkyl group, and

R⁶ represents H or 3-aminopropyl, provided that:

when A is N, R^4 and R^5 each represents a C1-C6 alkyl group or together represent a C2-C5 alkylene group which may contain a ring amine moiety -NR-, where R is hydrogen, a C1-C4 alkyl group, or the group $A-(CR^2R^3)_n$; and

when A is CH, R⁴ and R⁵ together represent a C2-C5 alkylene group containing a ring amine moiety -NR-, where R is a C1-C4 alkyl group or the group

$$A-(CR^2R^3)_n$$
-; and

25 2) a blowing catalyst according to the general formula:

wherein:

5

R⁷, R⁸, and R⁹ each independently represents a C1-C4 alkyl group;

R¹⁰ represents H, a C1-C4 alkyl group, a C6-C20 aryl group, or a C6-C20 aralkyl group; m, p, and q each independently represents an integer between 1 and 4, inclusive; and Z represents -OH, -NH2, -NH-CO-NH2, or

$$R^7$$
 N-(CH₂)_m-O-(CH₂)_p-NR⁹-(CHR¹⁰)_q-NH-CO-NH-

- 30. A method of making a polyurethane foam, the method comprising mixing 10 together a polyol, a polyisocyanate, water, and a catalyst composition comprising:
 - 1) a gelling catalyst represented by the general formula:

15 in which:

A represents CH or N,

n represents an integer between 1 and 3, inclusive,

R² and R³ each represent hydrogen or a C1-C6 alkyl group, and

20 R⁶ represents H or 3-aminopropyl, provided that:

> when A is N, R⁴ and R⁵ each represents a C1-C6 alkyl group or together represent a C2-C5 alkylene group which may contain a ring amine moiety -NR-, where R represent a U2-U3 aikylono 9.3--is hydrogen, a C1-C4 alkyl group, or the group
>
> A-(CR2R3)_n-

when A is CH, R4 and R5 together represent a C2-C5 alkylene group containing a 25 ring amine moiety -NR-, where R is a C1-C4 alkyl group or the group

2) a blowing catalyst according to the general formula:

$$N-(CH_2)_m-O-(CH_2)_p-NR^9-(CHR^{10})_q-Z$$

wherein:

5 R⁷, R⁸, and R⁹ each independently represents a C1-C4 alkyl group;

R¹⁰ represents H, a C1-C4 alkyl group, a C6-C20 aryl group, or a C6-C20 aralkyl group; m, p, and q each independently represents an integer between 1 and 4, inclusive; and Z represents -OH, -NH₂, -NH-CO-NH₂, or

10
$$R^7$$
 N-(CH₂)_m-O-(CH₂)_p-NR⁹-(CHR¹⁰)_q-NH-CO-NH-

31. The method of claim 30, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-2-hydroxyethylbis(aminoethyl) ether.

- 32. The method of claim 30, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-3-aminopropylbis(aminoethyl) ether.
 - 33. The method of claim 30, wherein the blowing catalyst comprises N,N,N'-trimethyl-N'-3-ureidopropylbis(aminoethyl) ether.

34. The method of claim 30, wherein the catalyst composition further comprises a carboxylic acid that forms a salt with one or both of the gelling catalyst and the blowing catalyst.

25

15

20

ML03141.APP.DOC